

Vincent Valdes: ITS Standards can facilitate the deployment of interoperable ITS systems, and make it easier to develop and deploy regionally integrated transportation systems. Transit standards have been developed by transit professionals like you at a national level to encourage competition and limit costs within our industry. However, these benefits can only be realized if you know how to write them into your specifications and test them. There are now a series of modules for public transportation providers that cover practical applications for promoting multi-modalism and interoperability in acquiring and testing standards-based ITS Transit systems.

Dave Matta: Hello, everyone. This is Dave Matta. And I will be presenting today, Module Fifteen Emergency Evacuation Standards of Communication Incident Management. It's an International Standards Organization ISO 19083 standard. As you may already know, we are in those early stages of the new age of information gathering. Just pull your mobile device from your pocket or purse and in an instance, you can talk to anyone in the world or use it to access the limitless network of information on the Internet. This small plastic device with the specialized circuit board is really the culmination of a career path that I followed and incorporates the technologies that are subject of this ITS based standard for emergency evacuation and disaster response and recovery. I've been lucky enough to have a rather successful career. I've spent twenty plus years as a contractor for various three letter agencies including the Department of Defense. During that time, I put to use the DOD's system engineering methodologies for developing systems that tracked everything from intercontinental ballistic missiles, to submarines, satellites and other targets that I can't share with you. When the Soviet Union went out of business in the early nineties I moved on to my second career path which transformed what was then termed as peace dividends into commercial products. I was in on the early adoption of GPS, cell phones and, of course, the Internet. I spent the next 20 plus years in the intelligent transportation system sector building a company that specializes in computer aided dispatch and automatic vehicle the location. I've been an expert to the International Standards Organization technical committee on intelligent transport systems, ISO TC 204 since 1996. In that capacity I'm editor for ISO 19083 Emergency Evacuation and Disaster Response and Recovery. Today, I will be describing to you how to use the ISO 19083 standards and a disciplined systems engineering approach to develop specifications for decision support system for emergency evacuation and disaster responses and recovery. The goal of the decision support system is to utilize existing and evolving ITS technologies, to provide knowledgeable transportation services before, during, and after a disaster. I hope you find this webinar informative and useful. As you can see by the next slide, there are four learning objectives associated with this webinar. The four learning objectives are meant to guide the viewer in developing a customized decision support system for transportation services, for emergency evacuation and disaster response and recovery. You will be hearing that term emergency evacuation and disaster response and recovery throughout this Web pilot I am hopeful that by the end of this presentation your understanding of the framework from which we will be able to use this to develop a set of system specifications. Learning objective one will focus on developing

the framework on helping you to develop your framework for your system. We will then move into roles and responsibilities of the associated transportation services for an emergency evacuation and disaster response and recovery. We'll follow that up by looking at the concept of operation and develop that concept of operation for the transportation services before, during and after a disaster. And then we'll finish up with looking at the characteristics of the system, everything from the actors that are involved to identifying the information flows and those characteristics, i.e., the architecture that we would use for the system. So let's begin by first looking at the framework and discovering just how to develop your framework which really are the boundaries of the emergency evacuation and disaster response decision support system. Let's first start looking at just what we're setting the system up for, the disasters. As you may develop before we want to look at the various disasters that would be impacting the area that you are in. Obviously, if you're in some place such as Kansas you would not be worrying so much about a hurricane disaster as you would about things like tornadoes. So weather related disasters, as you can see by my screen in front of you, are occurring at a faster rate. Some of this is obviously due to global warming and also other factors that we look at. In addition to that there are earthquakes that are on the increase. See it's not really so much that the earthquakes are in the increase but rather that the deaths related to those earthquakes are on the increase. And that, again, is due to population centers being in areas where there are more severe earthquakes occurring. And indeed, both weather and earthquakes are the real impetus for us developing this standard at the ISO level. In 2008, I began working on this as a result of Katrina which was an, obviously, weather related disaster of immense proportion to the New Orleans area. I was unable to garner enough ISO support at that time because it was looked at as mainly a U.S. problem. But then in subsequent years in 2011 when the earthquake in Japan hit all of a sudden we began to look at this again and determine that indeed with the numbers of disasters that are occurring and the severity of them that indeed, it was time to take on this standard and I'll go through the standard here in a moment. In addition to what disasters are occurring out there, you also need to look at what impact it is to your operations, what impact it is to your region. Obviously, the first thing that you see during the disaster in transit would be the equipment and facilities. If you take a look at one of the latest storms to hit, this is Superstorm Sandy. It was a hurricane in 2012. It caused \$6.2 billion for repair and restoration in public transportation. As you can see by the picture, there was significant flooding that occurred after Sandy struck the coast. In addition to equipment and facilities, you also see that services are impacted. That Hurricane Sandy was the worst transit disaster in U.S. history with over half of the nation's daily transit riders without service. And then, obviously, the impact to your ridership also is important. Those people who do not have access to vehicles whether it's because of their choice to live in the inner city area, where vehicles are not affordable. Or whether it's tourists that are in the area, guest workers, those people rely on public transportation for all of their transportation. And, obviously, it's not just during the disaster, it's the service interruption that occurs after the disaster. So we've looked at the types of disasters that are out there and the impact that these disasters have on our region or your organizations. In addition

to that, there are groups out there that are very interested in developing some type of assistance in doing these works. In this case in the U.S. we have both APTA, FTA and TRB doing significant work in these areas. In addition to the transit related organizations you also have homeland security and NEMA out there, the National Emergency Management Association, these are all national level organizations. In a disaster, you typically also have to look at the various regional organizations that would be involved in the disaster everything from state related, as the state would declare the disaster and provide the resources, everything from National Guard to the various emergency management facilities that they have. And then you also have the emergency evacuation role of transit which is directives that were provided by the president in helping to determine just how to use transit during the disaster. And then, obviously, you have your local organizations. So let's now look at what some of the missing components in ITS because what we're trying to do here is to take transportation services and ITS, intelligent transportation systems technologies and converge them into providing services before, during and after disaster. So what we see is that transit is in the national ITS architecture. But what doesn't seem to be out there are any data exchange with emergency operation centers. So that information that would be passed down from an emergency operations into a public transport operations, the operations control centers does not have any kind of standardized methodology for getting the information from there into the public transport operators. In addition, the passenger identification standards and emergency routing and schedule standards do not exist from public transport out to the travelers, to your ridership, to people that would need to be evacuated in that time of a disaster. So you see that area as missing components and we saw that as we did our gap analysis. And it begged for something to be developed in that standard.

So where does transit stand within providing transportation to the carless? But as we discuss throughout the presentation there are many roadblocks, inadequate communication leading the list. So those without access to automobiles depend on transit for mobility. And poor and inadequate communications is the major roadblock to providing that emergency services during the disaster. In addition to that, one of the things that we see is that because disasters really do occur so infrequently there is often this personnel turnover so you have this loss of knowledge in responding. So you need to have some way of passing that information on through various methods of allowing people to learn from the lessons before and apply that information to what's happened. ITS technologies do provide that platform for overcoming those roadblocks. And standards can organize that information and make sure that you have a dependable response to those types of situations. So what we developed was this ISO 19083 standard for emergency evacuation and disaster response. It's in development right now. The framework and concept of operations have been published and that information is available. We also are now working on defining the information flows that would allow you to switch packets between the various organizations out there. And then we also are looking at supporting disaster drills and exercises through the use of use cases. So just to reiterate what 19083 is, it's an International Standards Organization family of

standards where part one is the framework and concept of operation. Part two will be the information flows between the decision support system and the other users. And then part three are the use cases needed to support disaster drills and exercises. These things are used to, again, update the information in your system as you learn not waiting for a disaster to occur, but actually from the exercises and tabletop exercises that we produce. So what we're focused on today, though, is the part one standard. And you'll see on the screen there that the URL is up for accessing that standard from International Standards Organization. So where does the system actually fall within the framework of a disaster? As you see on the screen, the emergency manager is still in charge of the disaster. They operate out of the emergency operation center. We will control the emergency service personnel who are responsible for first responders. They will use their emergency communication systems to communicate with the first responders. You have traffic management, which, obviously, controlling the roads and providing information to the riding public through their traffic information systems. And then you have transit which is responsible for the carless public and recovery personnel if personnel are needed to be brought into the area because of the disaster. And they use their passenger information system to communicate that information. The EEDRR which is the emergency evacuation and disaster response and recovery system sits right at the top of all of three of the emergency services, traffic management and transit, and should actually be operated from the emergency operations center by transit personnel in a place where the emergency manager has access to that information and sources. And so that's where it fits within the framework. Now, let's start looking at the scope. I mean, obviously, the first thing that comes to mind is that, as I said, we're trying to converge transportation services with ITS technology. In this case it's all ground transportation services. And we would be looking at evacuation and disaster response and recovery transportation. So that's the focus of it. What it does not cover is any societal issues such as sheltering aid and security. It doesn't look at railway because that's not part of the ITS infrastructure. And it doesn't look at airports because, obviously, airports fall under their own guidelines for developing disaster responses. And so this is the foundation for developing the decision support system. What the EEDRR does propose is that it's a major paradigm shift to provide transit as the primary mobility agent for all of the transportation related actions. This includes preparing for a disaster, responding to a disaster and recovering from a disaster. And we use a common set of terminology another International Standards group developed. It's called ISO 22330 which is on security and resilience. And they have a set of terminology for disaster response and recovery that we follow. So just to let you know as you were reviewing this, that's what the terminology that's in the standard is developed from. The primary objective for the framework then, is, as I've said a number of times now is to develop a decision support system to deliver transportation services. And what we're trying to do is move people out of harm's way, move responders into the areas and provide transportation for recovery efforts. So it's evacuation response and recovery. Now, obviously, with transit taking that on the concern is that the needs for developing the evacuation and the response and recovery effort may overwhelm available transportation resources. So, obviously, it takes into

account the need to coordinate between multiple providers in an area. And also takes into account that you may have to use additional resources such as school buses that may not fall under the transit umbrella. So you may have to reach out and look for school buses, other means of transportation to deliver the services that are needed. And what it points out also is there's a need for a common agency to coordinate and deploy all of these suppliers. So the approach for developing this decision support system then is to make it a computer based information system. And then to start developing what decision making activities need to go into it. And in order to do that, we chose develop a concept of operation. And it is the key element in developing the scope of the system. So the first step in your ConOps is to understand your planning assumptions, what it is that you need to do? Who needs to do it? When they need to do it? And then to identify the needs and the needs are based on the population and the equipment that are available. And so let's take a look at the underlying steps or details in step one which is assumptions and needs. So to begin with the diagram that's on the screen right now is really an architecture diagram and you'll see this throughout the presentation. I won't go into the architecture right now but what I am using it for is to show you who the stakeholders are within developing the framework. Who you need to talk, who you need to make sure is in agreement with what the decision support system will be doing. And these include the emergency service network. These are the people that control the first responders. It includes the traffic management network which will control the roadways. They'll be used to determine what routes are available, what damage has been done. And then the transit management network which are the public transport transit entities that are in the area affected by the disaster and will need to provide their resources to either evacuate or respond to and recovery from the disaster. And then one other area that you need to look at is the social networks. These are used both for providing information to your riders or the evacuees, or the recovery personnel. But also to garner information as to what is going in a disaster. They can be a very valuable source for determining the severity of disasters and where things are in need of most resources. So those are the stakeholders. And so once you've identified your stakeholders really when you look at an evacuation it comes down to needing three things. You need to first identify the needs and by that I mean what people, how many people, how significant the population is that needs to be evacuated. And then using that information determine and analyze the response times by looking at the routing and how long it will take to get from wherever the staging areas will be to the shelters. And then finally assigning the resources to do the work that needs to be done and that includes both vehicles as well as operators as well as the logistics of supplying the gas and all of the other amenities that would go along with trying to operate a fleet to execute this evacuation effort. So in doing the needs identification, identifying your population, how do you do that? You want to start looking at the various types of populations that you have out there everything from your permanent residents, those people that are working in the area, those people that are living in the area, those people that are transient populations, tourists and whatnot. You also want to look at your special facilities needs and your schools. And so you can do that by surveys, by patrons who are issued special media or are also looking at the demographics. I've even seen places in

Florida where they offer people the chance to go ahead and sign up the web portals for evacuation services. In addition to determining the populations, then how do you calculate your response time. So there are modeling tools out there. What you need to do is determine the route, determine how long it will take to traverse that route, how much equipment will be required, mix and match the two to ensure that you can get most people out in the time allotted for wherever the disaster is taking you. And, again, modeling software is out there. There are some very flexible and dynamic scheduling software and traffic models for evacuation. Now, in addition to that once you've determined the routing, then you need to do the resource assignments. Obviously, you need to assign operators to buses and vehicles. We, again, look at the staging areas, where you would be able to refuel the vehicles and get new personnel on board. Monitoring the operation and using your-- in some people's case, I assume most transit operators do today still have a computer aided dispatching and automatic vehicle location type systems that will be able to use that information for monitoring the operations and personnel. And so what we then need to do is to plan for the unexpected. I mean, obviously, events occur that are both with and without warning; with warning, obviously, something like a hurricane. Or some significant flooding from rivers where the flooding is coming down river and you may have anywhere from hours to days to plan for an evacuation. To those types without warning such as an earthquake that would occur without warning or very little warning. Then you need to factor in what the critical infrastructure is and what the damage has been done to that critical infrastructure everything from the loss of fleet, what fuel supplies are available and facilities and, obviously, communication paths. In major disasters, you may see the communications challenges overwhelming everything because of the inability to find a way to communicate with not only the personnel that would be operating the fleet, but also the passengers that would need it. There's also limits within disaster forecasting. The clear example of this is indeed what happened in Japan with the earthquake where you had virtually a without warning, an earthquake. I mean there were minutes that they may have been able to have been communicating and a warning message via sirens. But the earthquake struck. Once the earthquake struck there was critical infrastructure damage but it wasn't significant because it was in Japan so they were fairly prepared for that. But what happened after that was the tsunami. And, again, you had this event was with some warning in that they had tens of minutes in this case to warn people to get out of the way. The tsunami warnings went off. And, again, what happened after the tsunami, though, is that there was a meltdown of a nuclear reactor. And, again, this caused a major disaster. And it caused a disaster that had both warning but also required different types of recovery efforts in that it caused an environmental contamination, which then required victim decontamination. And so when you're planning your disaster drills and efforts and responses you need to keep that in mind. And then finally, the last thing that come into mind is the animals. As we saw in many of the evacuations for any of the hurricanes people need to also bring their animals with them so you need to plan that as part of the unexpected. Then some other factors that come into the planning stage are the interdependencies of just where the shelters are in transportation. Obviously, you want to

move people out of harm's way but you don't want to move them so far that you're impacting how long it takes for routes to go. Another thing that you need to look at is the interdependency between response and recovery efforts. And by that I mean that those items that you choose to do during a response to a disaster may adversely impact what happens in the recovery area. As, for example, in both Sandy and Katrina disasters it was thought that some of the buses and equipment should be sheltered in place. And as a result all of the fleets were lost. And that impacted the recovery effort in that you were not able to use that equipment to get in there and move people back in after the disaster. So you need to keep that in mind, whatever choices you're making in your response will have recovery impacts. And then you need to look at also the special needs populations, people in wheelchairs, people in hospitals that would need ambulatory type ambulances for their recovery. I'm sorry, for their evacuation. So we've reached the end of learning objective number one and we have an activity scheduled for this. So I'll go ahead and read the question which is, which of the following is part of ISO 19083 standard. Is it A, sheltering, aid and security? B, railways, airports and ports. C, evacuation response and recovery. Or D, organizations, policies and procedures. If you chose C, evacuation response and recovery that is the correct answer. Hopefully most of you got that. I've emphasized evacuation response and recovery as being the focus of 19083. If you selected sheltering aid and security that's incorrect. There is a group out there. I think I've talked a little bit about it. It's ISO standard ISO 22300 which is societal security to cover sheltering aid and security. If you selected railway airports and ports that would be incorrect in that they are not part of the ITS realm. And then if you selected organization policies and procedures, while they are important to 19083 it's not what we're doing with 19083 in that we're looking at a decision support system that collects and analyzes ITS statement. So that ends learning objective one. Let's now move on to learning objective two and look at how you would develop the roles and responsibilities associated with the framework that we just looked at in learning objective one. To begin with it roles and responsibilities would really fall into step two of the ConOps. It's where you're trying to identify your actors and what actions your actors would be performing. Now, as I said before on a disaster of a major scale you have multiple organizations that would be involved in responding to the disaster. Everything from the local side to the regional state agencies out there. And then the federal agencies, depending on the size of the disaster, all three of these agencies may play a very important role. Or all three of these levels of agencies would be playing a very important role in the disaster response. The other organization out there that would not be directly involved but need to be factored into this are the non-government organizations such as the Red Cross and the media. So the stakeholders that we see for developing the decision support system would include the emergency manager which is the lead organization, the emergency services which are the first responders, traffic management, the car riding public and transit acting as the primary mobility agent for all of the transportation related actions. And by that, I mean all actions that would be required to bring in any types of sources that would be providing transportation to the non-riding or the carless public in this case. So let's look at the phases and activities associated with these roles and responsibilities. Once we determine

the actors, just what is it that they are doing during the disaster. To begin with, you need to do the advanced planning. And then this would be followed by a circular path where you would do-- once you've got your plans in place, the incident occurs, whatever that disaster is anything from something very major, to something that's localized, you would receive an incident notification from the emergency management personnel. This would cause you to activate and mobilize your emergency operations. And then you would follow that up with whatever evacuation operations are associated with the disaster. Once the disaster has passed and you're able to return to the area you would have a reentry activity. And then this would be followed by a debrief and assessment which would bring together all of the organizations that are involved in the disaster to basically do a Monday morning quarterbacking to determine what went right, what went wrong, what needed to be fixed in the next response effort. And so from that you would use that information to update your planning efforts so that you're ready for the next disaster. So let's just take a little bit more detailed look at that as in transit's role for advanced planning is looking at the transportation services, identifying the populations, looking at routing and determining times that various spots would take to determine depending on the area needing to be evacuated. Once the disaster is in progress, you would have incident notification and transit rural air would be to activate the operations center and alert all personnel that are associated with it. In addition, once the notification has been sent out, you would want to activate your centers. And in this case, you would move to the emergency operations center and begin operating in this case, I hope, the decision support system to identify the needs, to develop the routes and to assign the resources that are associated with that. These are high level information for you. And in the supplement that exists with this course you will see some very detailed information from about each one of these phases and the activities associated with that. And indeed, we'll keep developing that as we go along. So just moving forward, with the transit role during the evacuation and response activities, you deploy the personnel and vehicles and keep them in the hunt for doing the evacuation. Then once the evacuation is complete, the disaster has subsided you would go through the reentry which is, again, setting up the notifications and doing all of the routing. And determining how people will reenter the area that's been affected including when it's safe and what people need to be transported. You'll follow up with the debriefing and assessment where you will participate with the other agencies. And then update the plan based on the results of those meetings. Now, we have also developed a set of roles and responsibilities for the recovery phase. The recovery phase is different than what you see in the response phase. In this case, again, just like the response you do have the preparedness area of planning for recovery, determining just in this case what kind of mutual aid agreements might exist out there so that if you have to bring in additional resources from adjacent transit agencies or other agencies that are not necessarily associates such as the school bus operators, that you have this as part of your planning process. Then you would see some short term recovery things where you would be on the hook for bringing in recovery personnel, those people that are restoring services in the area, are providing security for the area to ensure that there's no looting, that type of short term recovery personnel that would be in the area, probably for weeks

as opposed to any long term. We would also have to plan or perform intermediate recovery type of activities where intermediate would be you're providing transportation services safe from shelter areas to ensure people are still able to get to their jobs or to do shopping or to doctors or whatever. But instead of taking them from your typical routes you would be expanding your routes to include these shelter areas. In addition to that you would have the long term recovery stuff and this would be repairing your infrastructure, making the projects available to ensure that your services are properly restored. Or in some cases setting up new routes because of areas of great devastation that we were not able to reenter but would need to provide services based on the impact to those routes. So that's some of the roles and responsibilities. And, again, just to reiterate some of that, as I said up front in the planning stage building those partnerships, the mutual aid types of things, assessing the cost and identifying your goals and coordinating that with the local and regional organizations. And one other thing that doesn't appear on the screen but is very important during those phases is to ensure that you are tracking the cost associated with all of the recovery efforts, as well as the response efforts because many times that is part of the disaster recovery and response efforts are funded by the various organizations out there from federal to state depending on the type of disaster that's been declared. So finding that funding is important. So where does transit then fall into the ITS realm in this? What I have on the screen is the national architecture and as you see, all three of the elements out that we've been describing appear on that national ITS architecture. You have traffic management, emergency management, and transit management all in there. And, again, this is included in the supplement with a clear description of this. What you find when looking at the details of this national architecture is that you have an emergency management service packages, where a service package represents a slice of the physical architecture. That is, it identifies what would be vehicles, equipment on the roadside. Those types of things that would be part of the ITS architecture and what service packages that are encouraged are used to develop the emergency management efforts are included in there. And if you look at the architecture there are really ten service packages. And I've got an example of one of them up on the screen. I won't read it but you can review each one of them in the supplement as we go forward. So what appears are these block diagrams where in this case you see that up in the upper left hand corner you have traffic management. They're responsible for the roadways. They would be using their signal control systems to give you greenways along certain corridors so that everybody is able to exit without having to stop at lights. In addition to that, you have emergency management that would come into play for the emergency vehicles, ambulances, police. And, again, they would use their signal control equipment to perform that same function of controlling the lights along a corridor. This is a tool that exists from the national ITS architecture. And if you look at the next level of it, these would be if you have your own regional architecture, block diagrams such as this would have your agencies within your area identified as to what emergency management, you know, the public safety dispatch would be using. They would be communicating to the public safety vehicles which would be communicating to the traffic signals. And as you see there these vehicles and dispatchers would also be

communicating directly with hospital care facilities. What we would see also being developed is something similar for the EEDRR. The framework would show transit agencies operating the transit vehicles and sending information on the evacuation routes. These vehicles also would be able to use their signal control technologies to control the signals. And in addition to that, the transit agencies would have a communications to the shelters so that the shelters know when vehicles are coming, when the next delivery or in some cases pick-ups would occur. So that's where transit could fit in. But when you start looking at the details you don't see transit identified at all in the evacuation services. In addition to that, the human services transportation operators that are not necessarily a part of the fixed route but are doing the para transit or demand response type transit are not include at all in that architecture. So even though transit has some defined services for weather events it's not part of that whole emergency management and traffic management responsibilities for evacuation. What you see then is that what we need to do is to develop a concept of operation that would allow transit to operate the transportation services during emergency evacuation disaster response and recovery. The purpose would be to really develop the repository for the preparations and planning's and provide the tools and checklist for actually supporting the disaster response and recovery activities. This concept of operation is not a technical document. It's not something that you would hand to your programmers. What it's used for is to gain acceptance from the stakeholders in the plan to make sure that you have convergence of all of the ideas that are out there and you reach that confluence by providing the concept of operations so that people can review it and update it. And from that, you get the needs definition. And that is what is it that needs to be done with respect to assessing the data, modeling tools and response and recovery efforts? And so what we hope to do there is then be able to describe transit's role for using a decision support system in emergency evacuation and disaster response and recovery. Again, we obtain those stakeholder agreements. We've managed the collaboration efforts using the concept of operation. What it also does is it defines the environment that the system will be operating in. And you then begin to derive your usual requirements and methodology for validating that the system is up and operational. So that ends the roles and responsibilities objective. What we'll do is move on to the activity and I'll read the question and you can answer the question. What paradigm change does the EEDRR propose for emergency evacuation and disaster response and recovery? Is it A, transit is the primary mobility agent for all transportation related actions? Is it B, transit supports emergency evacuation? Is it C, transit does not participate in disaster recovery? Is it D, emergency management relinquishes control of emergency operations center to transit emergency management? The answer is transit is the primary mobility agent for all transportation related actions. And, obviously, transit has the most experience and resources with doing that. And they need to be the folks that have both the role and the responsibility for conducting the emergency evacuations and disaster response and recovery efforts. If you said it supports emergency evacuation that's not really the paradigm shift. It's what happens right now. To an extent, the emergency management team will the local transit provider and say he we have an emergency, we need a bus or whatever depending on the extent

of it. So what this requires is that for those larger emergencies, disasters that are significant that transit would step up with its own organization to make sure that everybody is available to take on the role of providing that mobility agent support. If you said that transit does not participate in the disaster recovery you'd be wrong. Transit is a key player in that providing resources for recovery effort. And then emergency managers will not relinquish control of the operations center to the transit emergency operations personnel. They will operate in conjunction with the emergency manager at the operation center. So now let's look at developing the concept of operation. We've gone through what the disasters and how that framework from disasters could be used to develop the roles and responsibilities. And from those roles and responsibilities we now want to actually look at the concept of operation, how will these systems operate in the field to provide the support required? So let's look at what it takes to develop the concept of operation. Again, the standard does not have a concept of operation. It just has the template that you could use to develop it. But the purpose of you developing the concept of operation is to determine the scope of the decision support system. You'll do that by developing it, first looking at operational concepts, then developing the needs, looking at the environment that you're going to operate in, who is going to do what, when and how including the roles and responsibilities. And follow that up by actually looking at specific operational scenarios and developing the details for each of those types of scenarios that you would select. We don't have time to go through each one of those steps above. But what we will focus on is the operational scenario and how you would develop a user oriented operational approach. The rest of that information is included in the supplement and is included in the actual International Standards Organization standard that's available on the Web as I showed you before. So on defining the operational approach, obviously, you need to determine just what the scope of the services are buses, subways, light rail, obviously, controlling bridges, tunnels, roadways, ferries and stations are all important features in looking at all of the transportation services that would be required. Who are the command level roles that will be needed in the response and recovery efforts? So you need to identify the actual individuals that would be making these command level decisions. And then you need to also look at what your primary goals will be. Obviously, saving lives. You'd want to preserve property. That is make sure that your equipment and facilities are as disaster proof as possible moving equipment out of areas. You'd want to, obviously, do the evacuation as quickly and efficiently as possible. You'd also be responsible for moving responders into and out of the areas. And providing the actual resources, the services. To define the operational approach what we've selected is to use what we call a cognitive process. And what I mean by that I'll find that in three steps. Basically, what you do is the assessment, which is where you develop your situational awareness. And to do that you need to gather the information that's out here and make a decision about what the context of that data and information is telling you so that you can predict what the future needs will be. So you do the assessment development awareness as part of the cognitive process. Follow that by scheduling and this just synchronized the information that you receive from the situational awareness as well as what's happening in real time. It synchronizes that information and the resources

that are available to act upon whatever the actions are. So you'd want to coordinate and communicate this internally and externally and then acquire, prioritize and allocate the available resources. And then you follow this up by the implementation phase which is where you actually execute the actions and make the decisions needed to make sure that the evacuation response and recovery efforts are going as required. And, again, this would be recognizing the decision points along the way by utilizing the data and knowledge that's being captured by the decision support system. And then make sure that you maintain the admission priorities. Finally, what you'd want to do on the operational approach is to find transit's roles by each of the phases. In the response, as I said, we identify the actors before the specific ones that we recommend in the standards are the transit emergency manager who would be responsible for the overall emergency process. In addition to that you would have a transit operations coordinator who would be responsible. Would be a dispatcher personnel that would be responsible for controlling the vehicles and the operators and making sure that the plans that are put in place are being executed. The transit planning coordinator would be responsible for developing the routing and the transit.

The transit logic coordinator is then responsible for ensuring that fuel and maintenance activities on the fleet, during the disaster are put in place. In addition to that response phase you also have transit's role in the recovery phase. And, again, you would have a different set of personnel. The same person that's in the response phase would not necessarily want to be the person that's doing the recovery. The recovery manager is responsible for organizing the projects that would be developed as well as executing the mutual aid agreements that would be responsible to bring in outside resources if the agencies are being overwhelmed by the needs. You'd have the transit communications coordinator who would be responsible for communicating all of the information on the recovery effort out to the public. This would be an ongoing thing so that everybody knows what's going on, when it's going on and how it's going on. And then the project coordinator would be the person that would be responsible for obviously coordinating your project's that are in response to recovering your organization from the disaster. So the next thing then is let's take a look at the specific activities. In the response phase, you would have activation which would mean that somebody would declare the incident. You would notify your personnel. You would activate the emergency operations center. Then you would begin operating and once the response has been declared over you would go through de-mobilization effort. The recovery phase of the activity would take on a different path. First, you would have to do your assessment to determine just where the damage is and what resources need to be applied based on not only damages to your facilities, but where the shelters are and what the damages are done to the roadways and supporting infrastructure. Then you have to go through a prioritization effort to determine how to apply your resources, followed by the mitigation which is actually executing the plan. And then in the long haul, the infrastructure repair looking at the projects that would be part of the activities for the recovery phase. So once you've identified that the objectives which you would do based on the phases and what role, you can see here

some of the examples. I won't read them all but, obviously, the first objective in an activation by the transit emergency manager would be given an incident that requires a response from the transit emergency manager the user will immediately gather information to gain situational awareness. Those types of objectives are important and you would develop your own set of objectives as you're looking to develop your custom concept of operation. You would take those objectives then and break them down further into the activities that would need to be developed. In this case you can see task, condition, standards. And, again, all of this information is included in the standard and it provides details for each one of the objectives that are listed. And the standard is, I think, probably 40 or 50 pages long. So when you look at that, the details, the tasks to be performed will be the actions. The conditions are the criteria. The standards are what guidelines you'd provide so that you have the same types of outcomes, the reoccurring outcome. Expected actions would be the step by step activities in enabling requirements. And then don't forget about the measurement methods, how do you know what you're suggesting to be accomplished is doing the right thing? And, again, that comes as part of that measurement methodologies. So the template itself, the concept of operation will include the objective, the task, the condition and the standard. And then the measurement methodologies. And these are all just examples so that when you actually go to develop your own system you will not be sitting here wondering where to start from. That's what this is meant to do. It's meant to allow you to use the template to follow through some flow. And then add your own custom efforts as you see fit based on the operational conditions at your organizations. So once you've gone through that set of objectives what you want to then do is start looking at specific scenarios. If the standard itself has four scenarios that it works off of one is for hurricanes, one is for earthquakes with tsunamis, one is for flooding. And then the fourth one is for a hazmat type operation or event. And so in those scenarios, this is just the types of information. I won't go through all of that right now. You can come back to it as you're developing it. But you want to develop it based on the types of scenarios that will be likely to occur in your area. And what you'll see on this example, a hazmat scenario. And this lists the actual scenarios themselves and the actions that are required. And, as I said, there are multiple ones in the standard itself that you can use as you move forward. So once you've looked at the scenarios what you then move on to is the environment, the support environment that you're going to be operating your decision support system in. The first thing you'll see in the standard itself is the recommendation that we use a cloud architecture. And the reason that we've selected the cloud architecture is that as we went through the assessment of the environment it was obvious that in a disaster one of the things that happens is that the transit agency or the emergency management center maybe right in the middle of where the disaster is occurring. And so you have to have available access to that system from anywhere. And that's why a cloud based architecture is the perfect solution that will allow you to store the scenarios and templates and communicate with the external partners and analyze data from the various social networks. And indeed, if you think about it, if you look at what's on the screen right now it would be very similar to what you would see in your decision support system. Obviously, not the information that's

on there but the overall environment where you have on the left hand side of the screen the information that you're gathering from your decision support system being displayed so that you can make the decisions. And that information is gathered obviously you take the data in, you take the information in. From that information and data, you develop your knowledge. And from that knowledge you're able to make your decisions based on that information that's on the left hand side of the screen. On the right hand side of the screen there are the control panels. And those control panels allow you to access the various other functions that would need to be brought into play whether it's a communications function with somebody outside, whether it's an alert function, whether it's bringing on additional information from the decision support system. It would be a similar set up as to what you see on the other side of the screen, that little control panel from GoToTraining. So I see that as being very similar to what the support environment would be. Then you would move on to the developing your actual system architecture. We have a template for our system architecture in the system or standard. And as you see on the screen there it shows the external networks and the various layers within the decision support system. I'll come back to this later. I won't get into all of the architecture right now because I want to talk about it later. But the actual decision support system has three layers, the interface layer, the knowledge layer and the cloud infrastructure layer. And so once you develop your architecture, you then look at what operational impacts it will have to your organization. Obviously, you'll have to be acquiring real time data from your fleet, from probes, from traffic, from first responders, from the social networks out there. You'll have to establish your command and control processes and procedures so that when you looked at the actors that we have listed before where you have an emergency manager, you have a logistics manager, you have communications personnel. They all are part of that command control structure. You'll have to process the data, advise the strategies for turning that data into both information and knowledge so that you can make your decisions. You'll coordinate and control your efforts so you want to have the ability to access your computer aided dispatch and automatic vehicle location systems so that you can control that evacuation and get personnel assigned properly. And then you also have to do test and updates for exercises and lessons learned. So all of those things will impact your organization and need to be planned as you're developing the decision support system. So that ends learning objective number three. And so what we've done so far is, again, looked at disasters and the framework that disasters apply to a decision support system. We've looked at the roles and responsibilities and how that impacts the disaster response and recovery efforts. And we've moved on to just now cover the concept of operation and how you can develop your own concept of operations using ISO 19083. So what I want to do next is just follow up with the question that's associated with learning objective number three. It is what is the purpose of developing a concept of operation for EEDRR? And the answers are A, find support for funding a new system. B, you resolve labor issues associated with operating a system. C, identify the size of operational forces needed for a disaster. Or D, develop the scope of a decision support system. The answer to that and the answer is develop the scope of a decision support system. That's what the concept of operation really is meant to do. And if it's properly

done you'll have a decision support system that you'll be able to operate in times of the disaster. If you answered that finding funding for the system, the concept of operation may be used to determine the amount of funding. But it won't be used to actually obtain any funding. To resolve labor issues associated with operating system is incorrect. It will point some labor issues out as in, how do you handle unions and trying to call in operators in support of disasters. But that is something that needs to be resolved. And then if you said identify the operational force needed for disasters it's a product of the system but it's not part of the concept of operations. It's how you determine that you need that. But it's not part of that concept of operation. So let's finally wrap up with learning objective number four and look at how this, all of the things that we've covered in the other three learning objectives apply to a decision support system in transit. Again, if we look at the architecture and I'll go into a little detail here. You see the external networks and those are all of the people that would be the actors that would be involved in the disaster, emergency services, traffic management transit and social networks. When you look at the decision support system itself, as I said, there are three layers. You have the interface layer which is responsible for collecting all of the data and that data collection includes validating the data. And it's not only data. You may be actually collecting information that is the emergency services network may be collecting the raw data and processing that data into information. You may just be requesting some specific information. The same with the traffic management networks. You may just be requesting what lanes are being closed as opposed to looking at actual probe data. The transit management network and social networks we've talked about with the social networks proving both data and you using those networks to communicate with the riding public. So all of that information would be collected by the interface layer. In addition to that, the command and control functions would also be included in that interface layer. The knowledge layer would be the part where, as I said, a number of times, you would take your data in. You would turn the data into information. You would take that information and hopefully be able to use it as knowledge. And then you would use that knowledge to make your decisions. So that's where the knowledge layer comes. It's providing you the look that you're able to make the various decisions along the way. And as you may expect or may have experienced, disasters are ever changing and decisions are being made in rapid fire in most situations. And then the cloud infrastructure service layer would allow the system to operate from anywhere and provide access to the networks to allow you to do communications. So that's what the information network looks like. In addition to that, you need to look at the emergency communications methods that are available in your area. You would look at whether what your open source networks are, and those are things that are coming into play that would be replacing landline type systems, the telephone systems that are there that allow you to communicate over the Internet. Private sources such as your radio networks that are out there, the voice networks which is cellular and communication networks. And then obviously the social networks. And ways that you would be able to access all of those from your decision support system. You'd also want to look at the information flow needs. Again, the interface layer is responsible and we focused mainly on those external networks looking at gathering data from them.

But you will also be providing very important information to them. So that would be what buses, what vehicles, when they will be arriving, what types of facilities are at the staging areas or all of that information would be included in those information flows. And indeed, when you look to developing that information it becomes very detailed and needs to be examined from numerous levels and that's why we decided to create a separate part to the standard for doing the information flows, where you are looking at the various types of information that need to be projected into the systems. So, again, just look at the layers, again, the interface layer, the knowledge layer, and the cloud layer will all be instructed to do the various techniques and information gathering, knowledge gathering, and communications that we've identified before. And as you develop your system you will indeed be able to collect the data and do the requirements assessments so that you're able to go out and acquire a system on the market. And so finally, let's just look at the characteristics of what the decision support system is. First, it's an information provider. And it will collect that information or provide that information from the various sources there in the green traffic controls, and call centers, whether the traffic flow models, satellite images, social networks, they all come in through that external network and interface layer. Next, it's an information manager who will want to take the information and validate it. It will generate scenarios based on the demographics, the resources and the routes. It will propose solutions through simulation and certification so that when you come up with a plan to evacuate an area you can simulate it. Or you can go through some certification processes of those routes. And then finally, it's an information manager based on the scenarios that you've selected. And that's how all of that information should be gathered and at the top layer. And then, obviously, the last part is the information distribution. You'll want to be able to communicate, obviously, via the Internet and any open sources out there, private sources, voice networks, using cellular and emergency communications will be available to you in your system. And then also the social networks. And this is all done from the cloud infrastructure layer to allow you to operate this system anywhere, anytime, and give you access to all of the data that's stored there. So that concludes the last learning objective. And we'll follow that up with a question that you'll have to answer, which is, which layer is not a layer in the emergency evacuation disaster response and recovery decision support system? Is it A, the network? B, the interface layer. C, the knowledge layer. Or D, the cloud infrastructure services layer. The answer is the network layer. It's the external network and it's located outside of the decision support system. It's part of the entities that are out there that will allow you to collect and communicate information. The interface layer is part of the system as well as the knowledge layer and the cloud infrastructure services layer. So what have we learned from the module? Hopefully, you've been able to see that you will have to develop your own framework but the standard 19083 Part 1 will help you in doing that. It will also help you in developing the roles and responsibilities that you will need for performing the disaster response and recovery efforts. And it will be used as the concept of operation to develop the scope for that decision support system. And then we review those characteristics as that final learning objective. So I just want to thank you for staying with us. And I hope that you found it very useful. And we'd like to encourage you to go ahead

and provide us feedback using the feedback link below. And thank, you again, for participating in this webinar.

End of 2016_09_21_10.33_Mod_15_Final_Record.mp4####